**Catalogue of American Amphibians and Reptiles.**

MARTOF, BERNARD S. 1970. *Rana sylvatica.*

## *Rana sylvatica* Le Conte
## Wood frog

*Rana sylvatica* Le Conte, 1825:282. Type-locality, not stated; designated as "vicinity of New York City" by Schmidt (1953:81). Type-specimen not known to exist.

*Rana pennsylvanica* Harlan, 1826:58. *Nomen nodum.*

*Rana cantabrigensis* Baird, 1854:62. Type-locality, "Cambridge, Mass. (Collection of Prof. Agassiz.)," in error (Howe, 1899:369); designated as Moose Jaw, Saskatchewan by Schmidt (1953:81).

*Rana temporaria silvatica*: Günther, 1858:17. Emendation and placement as a "variety" of *R. temporaria.*

*Rana temporaria cantabrigensis*: Cope, 1875:32. Subspecific status proposed.

*Rana cantabrigensis cantabrigensis*: Cope, 1886:520. New combination.

*Rana cantabrigensis latiremis* Cope, 1886:520. Type-locality, "Lake Alloknagits," Alaska, now Lake Aleknagik, north of Nushagak, Alaska (The Times Index Gazetteer of the World, London, 1965). Syntypes (4), U. S. Nat. Mus. 13723–6 collected by C. L. McKay, 27 September 1883.

*Rana sylvatica sylvatica*: Schmidt, 1938:378 (specific status for *R. sylvatica* again recognized).

*Rana sylvatica cantabrigensis*: Schmidt, 1938:379 (reduction to subspecies of *R. sylvatica*).

*Rana sylvatica latiremis*: Schmidt, 1938:378. New combination.

*Rana sylvatica cherokiana* Witschi, 1953:764. Type-locality, Murphy, Cherokee County, North Carolina, elevation 462 m. Holotype, U. S. Nat. Mus. 134417, male, collected by J. C. Nicholls, Jr., 20 January 1953.

• CONTENT. Five subspecies have been described, but none is currently recognized (Conant, 1958; Martof and Humphries, 1959). See COMMENT.

• DEFINITION AND DIAGNOSIS. This is a small to medium-sized ranid; body size at metamorphosis 13 to 22 mm, adults 37 to 83 mm. The dorsolateral folds are prominent and extend over the body from the head to near the vent. The back is smooth to moderately rough, often with short folds between the dorsolateral folds. Toes are webbed; however, two or three phalanges of the fourth toe are free of the web. The dorsal ground color varies from gray through tan to vivid reddish brown, sometimes coppery or golden. A middorsal white line is present on many northern and western specimens. Black or dark brown markings may be present on back and sides. The lateral edge of each dorsolateral fold is darker than the medial edge. A conspicuous dark brown or blackish marking (mask) extends from the snout to just behind the tympanum. A contrasting light stripe occurs on the upper jaw below the mask. The venter is white, sometimes with dark mottling on throat and breast; it is smooth except for a granular area under the thighs. A prominent dark marking occurs in the pectoral region (on each side of chest near base of foreleg). In both sexes the tympanum is smaller than the eye. Females are larger and generally more reddish. The males have paired vocal sacs and stout forelegs. The "thumb" and the webbing between the toes of the male are greatly enlarged during the breeding season. At the breeding sites males tend to be darker than females; however, after only a few hours in captivity males become considerably lighter in color. See REMARKS regarding geographic variation.

Throughout most of its range *sylvatica* is the only ranid with a distinct mask. The most similar American species are *R. pretiosa* (ranging from northern California, central Nevada and Utah northward to southeastern Alaska) and the allopatric *R. cascadae* (found in the Cascade Mountains from northern California to northern Washington). These frogs usually have a mask, but on some it is faint. Living specimens of both species can easily be distinguished from *sylvatica* by their sluggish and more aquatic habits and by their yellow, orange or red abdomens and undersides of the hind legs. Preserved specimens lose this diagnostic ventral coloration making them more similar to *sylvatica.* Preserved *pretiosa* and *cascadae* are best identified by (1) their inky (often large and irregular) dark spots on back and top of head and by (2) their dusky or clouded or markled with gray venters. The wide nostrils of *cascadae* and the somewhat upturned eyes of *pretiosa* also distinguish these species from *sylvatica.* The Eurasian wood frogs related to *R. temporaria* closely resemble *R. sylvatica.*

• DESCRIPTIONS. Detailed descriptions of adults were provided by Wright and Wright (1949:540 and 544), Stebbins (1951:373), Logier (1952:107) and Martof and Humphries (1959); eggs and egg masses by Livezey and Wright (1947) and Wright and Wright (1949:36); and tadpoles by Wright and Wright (1949:54), Stebbins (1951:380) and Logier (1952: 107).

• ILLUSTRATIONS. Several fine photographs of adults are available: Dickerson (1906:plates 78 and 79), Walker (1946: 106), Wright and Wright (1949:534, 545), Martof and Humphries (1959:371–375), Cochran (1961b:159), Smith (1961: 109), Wheeler and Wheeler (1966:53), and Huheey and Stupka (1967:plate 35). Excellent colored illustrations occur in Dickerson (1906:color plate 14), Conant (1958:287) and Stebbins (1966:plate 12). See Wright and Wright (1949:30 and 534)

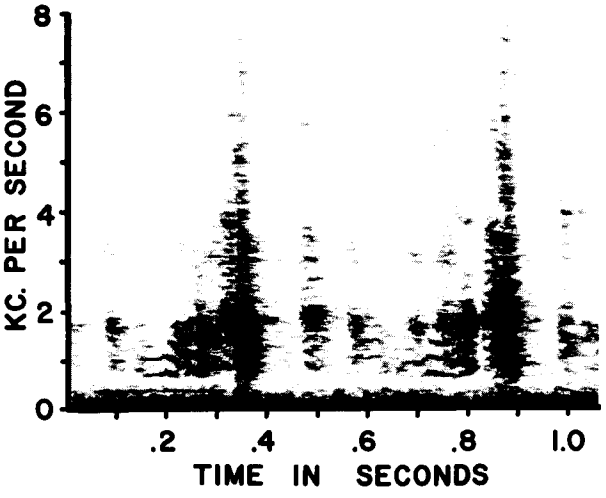
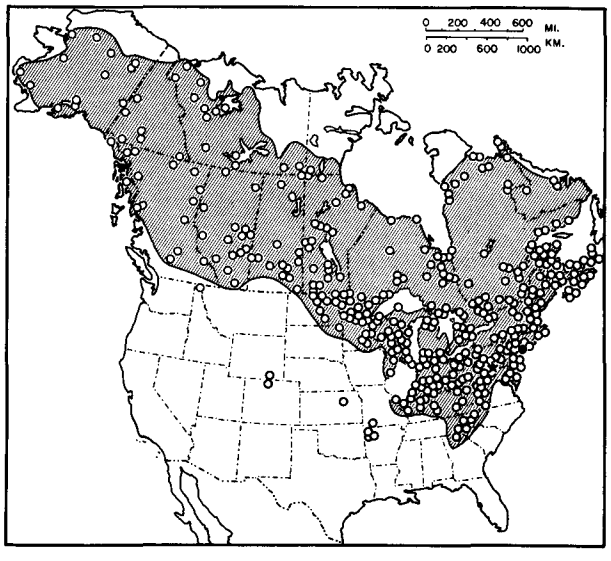



FIGURE. Audiospectrogram (narrow band, 45 cycles per second) of call of *Rana sylvatica*: Huntington, Long Island, New York, 5 April 1969, water 11.4°C. (Amer. Mus. Nat. Hist. Dept. Herpetology tape library).




MAP. The solid circle marks the designated type-locality; open circles indicate other records. The star marks a fossil locality.

for photographs of egg masses. Line drawings of the egg and its membrane and comparisons with other species are available in Wright and Wright (1949:35) and Stebbins (1951:433, 1966:209); developmental stages of egg and embryo, Pollister and Moore (1937); tadpole, Stebbins (1951:461, 1966:214); mouthparts of tadpole and comparisons with other species, Walker (1946:22), Stebbins (1951:463), Smith (1961:66); tooth structure of tadpole and comparisons with other species, Gosner (1959:203 and 204); and adults, Stebbins (1951:410 and 1954:136). The chromosomes are figured and compared with those of *R. pipiens* by Hennen (1964). The call of *R. sylvatica* is included in the record album "Voices of the Night" (2nd ed., Comstock Publ. Co., Ithaca, New York).

• DISTRIBUTION. This is the only cold-blooded tetrapod known to occur north of the Arctic Circle in the Western Hemisphere. Its geographic range extends over most of Alaska and Canada and over the northeastern part of the United States, with the northern limit along the tree line from Alaska to Labrador. It ranges southward coastally to Maryland and in the Appalachian Mountains to northern Georgia and northeastern Tennessee. The southern boundary of the range passes northward through southern Illinois and the northeastern corner of South Dakota, the northeastern half of North Dakota, northern Idaho and westward in Canada to near the Pacific coast. Isolated populations occur in southeastern Wyoming and northern Colorado, in eastern Kansas, in the Ozark Mountains of Arkansas and Missouri, and possibly in valleys and tundra ponds north of the Arctic tree line.

The following list records some of the numerous papers presenting distributional information on *Rana sylvatica*. Alaska and the western half of Canada: Ferguson (1956), Harper (1963), Hock (1956), Kessel (1965), Logier and Toner (1961), Loomis and Jones (1953), McClure (1943), Moore and Strickland (1955), Nero and Cook (1964), Preble (1902), Shelford and Twomey (1941), Sutton (1968), Tamsitt (1961), Weintraub (1967), and Wynne-Edwards (1962). Eastern Canada: Backus (1954), Bleakney (1952, 1954, 1958a), Cook (1967), Evans and Roecker (1951), Harper (1956), Hildebrand (1949), Lindeborg (1950), Logier (1952), Logier and Toner (1961), and Werner (1959). Southeastern United States: Barbour (1956), Dowling (1957), Gentry (1955), Humphries (1957), Hutchison (1956), and Quinby (1954). Midwestern United States: Breckenridge (1944), Breukelman and Smith (1946). Fishbeck and Underhill (1960), Loomis and Jones (1948), H. M. Smith (1956), P. W. Smith (1961), P. W. Smith and Minton (1957), Suzuki (1951), Walker (1946), and Wheeler and Wheeler (1966). Western United States: Baxter (1949a), Dumas (1957), Maslin (1947, 1959), and Stebbins (1951, 1966).

*Rana sylvatica* is terrestrial, being most common in or near moist wooded areas, often considerable distances from open water. In the far north it may occur whenever there are shallow ponds and pools for breeding. It breeds very early in the season, even before the ice is off the water. This "explosive" breeder lays its egg in the course of a few days; the adults then disappear from the ponds. The mating call has little carrying power; it has been described as a rasping "craw-aw-auk" or as a hoarse clacking call suggesting the quack of a duck. The globular egg masses are attached to vegetation below the surface of the water. Each is about 2.5 to 6.0 inches in diameter and contains about 2500 eggs. The tadpoles generally transform in 40 to 90 days after hatching, but in northern Canada and Alaska overwintering may occur. Tadpoles with little evidence of legs were observed (Bleakney, 1954) at Fort Chimo, Quebec, on August 22, only a few weeks before the winter freeze-up. The metamorphosed frogs are insectivorous, feeding chiefly on beetles and flies (Martof and Humphries, 1959; Moore and Strickland, 1955). Hibernation occurs under leaves, logs, or stumps in wooded ravines (Wright and Wright, 1949).

• FOSSIL RECORD. There is a possible late Pleistocene record from Bedford County, Pennsylvania (Guilday, Martin and McGrady, 1964).

• PERTINENT LITERATURE. The literature on this species is voluminous, hence, only the more germane and recent references are included. Important general references are: Conant (1958), Darlington (1957), Martof and Humphries (1959), Moore (1949), Stebbins (1951, 1966), and Wright and Wright (1949). Many references cited under DISTRIBUTION contain notes on ecology. Additional references and their principal topics are given here. Variation: Martof and Humphries (1959), Schmidt (1938), Suzuki (1958). Nomenclatural history: Martof and Humphries (1959). Food, feeding and predation: Abbott (1894), Bleakney (1958b), Cory and Manion (1953), Gosner (1959), Moore and Strickland (1959). Sex recognition and mating behavior: Banta (1914), Noble and Farris (1929). Activity and habitat: Baxter (1949b), Bellis (1961b, 1962), Brattstrom (1962), Heatwole (1961), Tamsitt (1961). Tadpole survival: Herreid and Kinney (1966). Physiology: Brattstrom (1968), Davison (1955), Johansen (1962), Schmid (1968). Temperature and rate of development: Herreid and Kinney (1967), McConnell (1966), Moore (1939, 1940a, 1940b, 1949), Ray (1960). Growth: Bellis (1961a). Developmental physiology: Cheng (1932a), Dettlaff and Dettlaff (1960), Etkin (1959), Gregg (1960), Hammerman (1963). Development of skull: Feinsmith (1962). Transfer of embryonic nuclei: Moore (1958a, 1958b, 1960). Sexuality: Cheng (1929, 1930a, 1930b, 1932b), Chieffi (1959), Witschi and Chang (1950). Hybridization: Moore (1947, 1951), Moore and Moore (1957), Witschi (1953).

• REMARKS. The largest wood frogs occur in the southern Appalachian Mountains; females average 66.8 mm in body length, males 54.8 mm; largest female 82.5 mm, largest male 62.5 mm. A sharp decrease in body length occurs to the northwest of the Appalachians. The smallest adult individuals occur in northern Manitoba and Saskatchewan and the adjacent part of the Northwest Territories; adults average less than 45.0 mm. Sexual dimorphism in body size is greatest in the Appalachian area where the ratio of average size of females/males is 1.21. It is least (1.02) in the Northwest Territories and in northern Alberta. The longest-legged frogs occur in the southern Appalachians where the tibio-fibula averages 62% of the body measurement; the shortest are from northern Ontario, Manitoba, and Saskatchewan with an average of 44%. Specimens from the western half of the geographic range average less than 50%.

A prominent middorsal white line characterizes most wood frogs from northern Quebec, Manitoba, northern Saskatchewan, the Northwest Territories, the Yukon, most of Alaska, southern British Columbia and Alberta. All frogs from the Wyoming-Colorado area possess the middorsal stripe; whereas those from the southern and eastern parts of the range (Labrador to Arkansas) lacks this marking. Frogs from the southeastern part of the range have the largest number (average over 3.0), the most regular shaped, and the most distinct tibial markings. Those from Wyoming-Colorado have the fewest tibial markings (average less than 2.5), the most irregular in shape, and the least distinct.

Western and northern wood frogs have the least sexual dimorphism, the most pointed snouts, and the most conspicuous markings. In Colorado and Wyoming the middorsal light stripe is bordered by a contrasting brownish region. Also, each dorsolateral fold is bordered medially by a light tan region and laterally by a darkly pigmented one. In western Canada and Alaska the dorsum is brown with a grayish or bluish tint, the sides of the body are bluish-white, and the dorsal and lateral markings are very dark brown or black. Their dorsolateral folds are poorly developed in comparison to those in Colorado and Wyoming.

The reddest and the least conspicuously-marked frogs occur in the southeastern part of the range. They also have the most rugose hind legs, the bluntest snouts, and the greatest sexual dimorphism. Specimens from Maine are the darkest and have the most abrupt transition between dorsal and ventral pigments.

Populations in the midwestern states and those in eastern Canada show affinities to those in all other parts of the range. Those in eastern Canada lack contrasting dorsal pigments and are remarkably uniform in color.

• ETYMOLOGY. The name *sylvatica* is derived from the Latin *sylva* meaning "a wood(s)" and *sylvaticus*, "growing among trees." Thus the scientific name and the common name of this species appropriately refer to its habitat.

## COMMENT

P. W. Smith (1961) "provisionally retained" subspecific names "for the two types of wood frogs represented in Illinois." He designated the larger and longer legged specimens from the southern part of Illinois as *R. s. sylvatica* and northern specimens with rougher skin and more dorsal markings as *R. s. cantabrigensis*. Such a separation is not substantiated by consideration of the several broad, discordant clines over much of the geographic range (Martof and Humphries, 1959). However, Porter (1969) reported that 99 per cent inviability resulted from crosses of Wyoming and Manitoba frogs. More information on the biology of the wood frog obviously is needed.

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